FIGURE 1 (Prior Art)

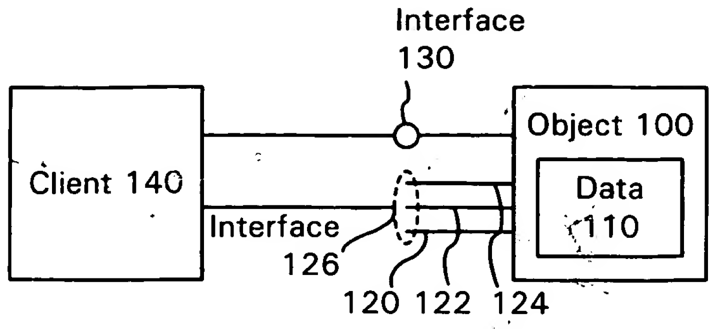

FIGURE 3 (Prior Art)

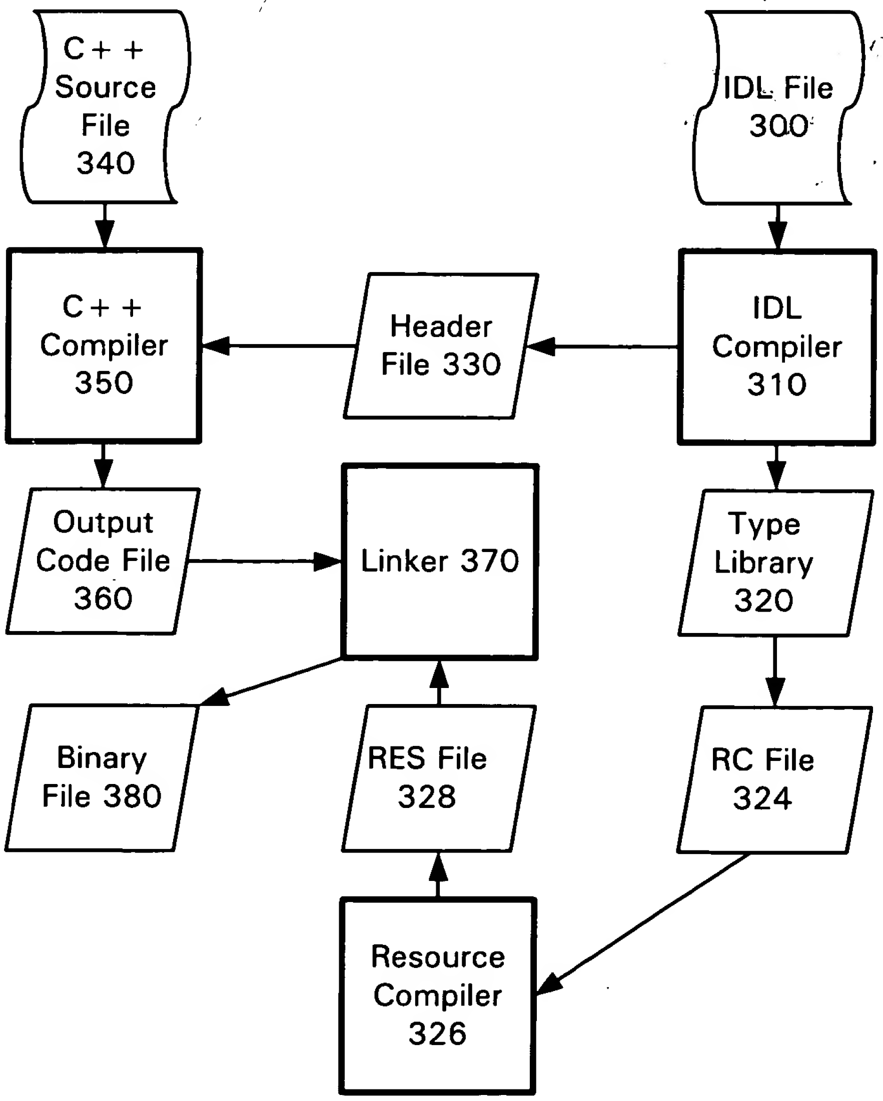

FIGURE 2a (Prior Art)

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```
import "docobj.idl";

enum E {
   e = 17,
};
struct S {
   int i, j;
};

[version(1.0), helpfile("test.res"), helpcontext(12), uuid(eed3644c-8488-3ecd-ba97-147db3cdb499) ]
library MyLib
{
   importlib("stdole2.tlb");
   importlib("olepro32.dll");

  [uuid(1AECC9B3-2104-3723-98B8-7CC54722C7DD), helpstring("interface ITest")]
   dispinterface ITest {
   properties:
   methods:
      [id(34)] void Grade([in] enum E , [out,retval] char *);
      [id(18)] HRESULT Score([in] struct S *a, [in] float b, [in] VARIANT c);
   };
```

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To Figure 2b

FIGURE 2b (Prior Art)

To Figure 2a

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```
    [object, uuid(1DAD4027-2BA5-34F1-AD39-76A637E6579E), helpstring("interface ITest2")]
    interface ITest2 : IUnknown {
        void  __cdecl  Display();
        [propput] void  StudentID([in] int );
        [propget] void  StudentID([out,retval] int *);
        HRESULT  Hours([in] int , [in] float );
    };

    [uuid(12341234-1234-1234-1234-123412341234), version(1.0), helpstring("interface CTest")]
    coclass CTest {
        dispinterface ITest;
        interface ITest2;
    };
}
```

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FIGURE 4

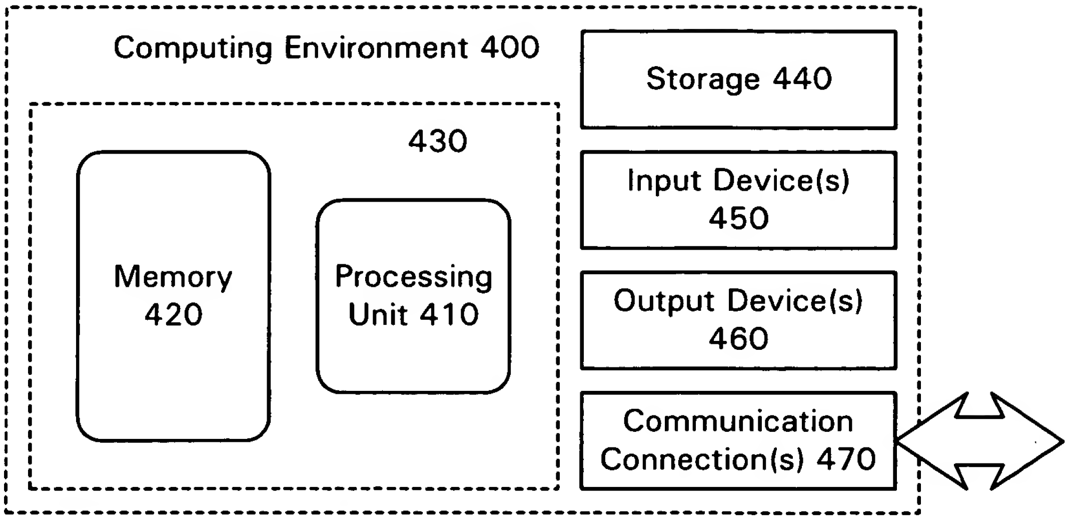
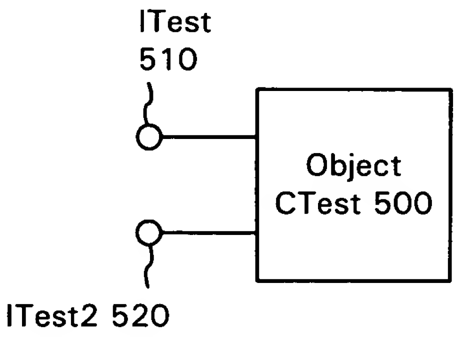


FIGURE 5



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```
#define _ATL_ATTRIBUTES 1
#include "atlbase.h"
#include "atlcom.h"
extern "C" int printf(const char*, ...);

// IDL library block and overall project settings
[project(type=dll, name=MyLib, helpfile="test.res", helpcontext=12)];

[export] enum E {
   e = 17
};
[export] struct S {
   int i, j;
};

[dispinterface, helpstring("interface ITest")] __interface ITest : IDispatch {
      [id(34)] void Grade([in] E, [out, retval] char*);
      [id(18)] HRESULT Score([in]Ŝ* a, [in]float b, [in]VARIANT c);
};

[object, library_block, helpstring("interface ITest2")] __interface ITest2 {
      void __cdecl Display(void);
      [propput] void StudentID([in] int);
      [propget] void StudentID([out,retval] int*);
      HRESULT Hours([in]int, [in]float);
};
```

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To Figure 6b

FIGURE 6a

To Figure 6a

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```
[coclass, progid(CTest.17), helpstring("interface CTest"), uuid(12341234-1234-1234-1234-123412341234)]
struct CTest : ITest, ITest2 {
    void Grade(E e, char* pc) {
        printf("CTest::Grade(e=%d)\n", (int) e);
        *pc = 'A';
    }
    HRESULT Score(S* a, float b, VARIANT c) {
        printf("CTest::Score(a=%p,b=%f,c=%d)\n", a, b, c.lVal);
        return S_OK;
    }
    void Display() {
        printf("CTest::Display()\n");
    }
    void put_StudentID(int i) {
        printf("CTest::put_StudentID(i=%d)\n", i);
    }
    void get_StudentID(int* ) {
        printf("CTest::get_StudentID()\n");
    }
    HRESULT Hours(int a, float b) {
        printf("CTest::Hours(a=%d,b=%f)\n", a, b);
        return S_OK;
    }
};
```

FIGURE 6b

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FIGURE 7

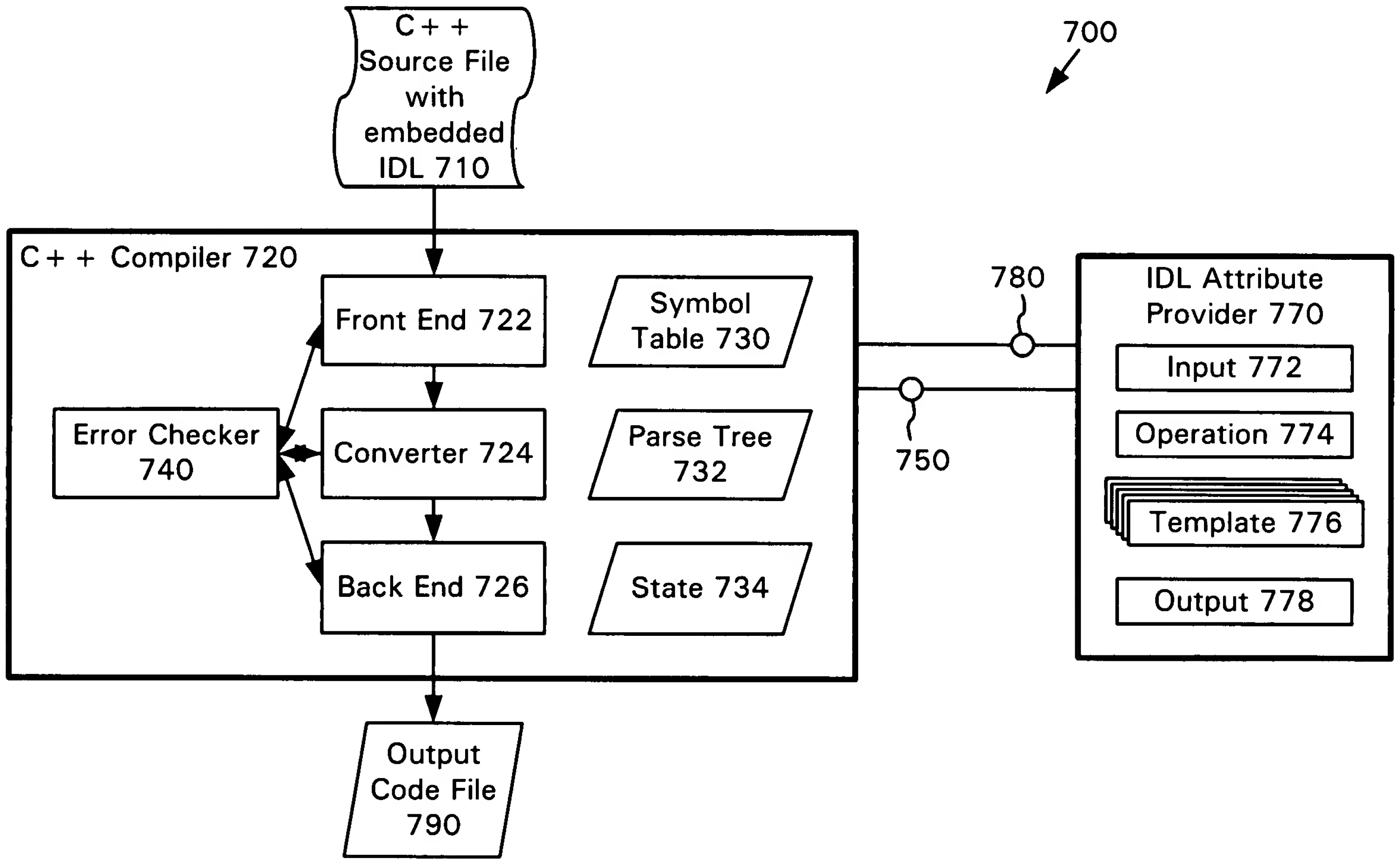

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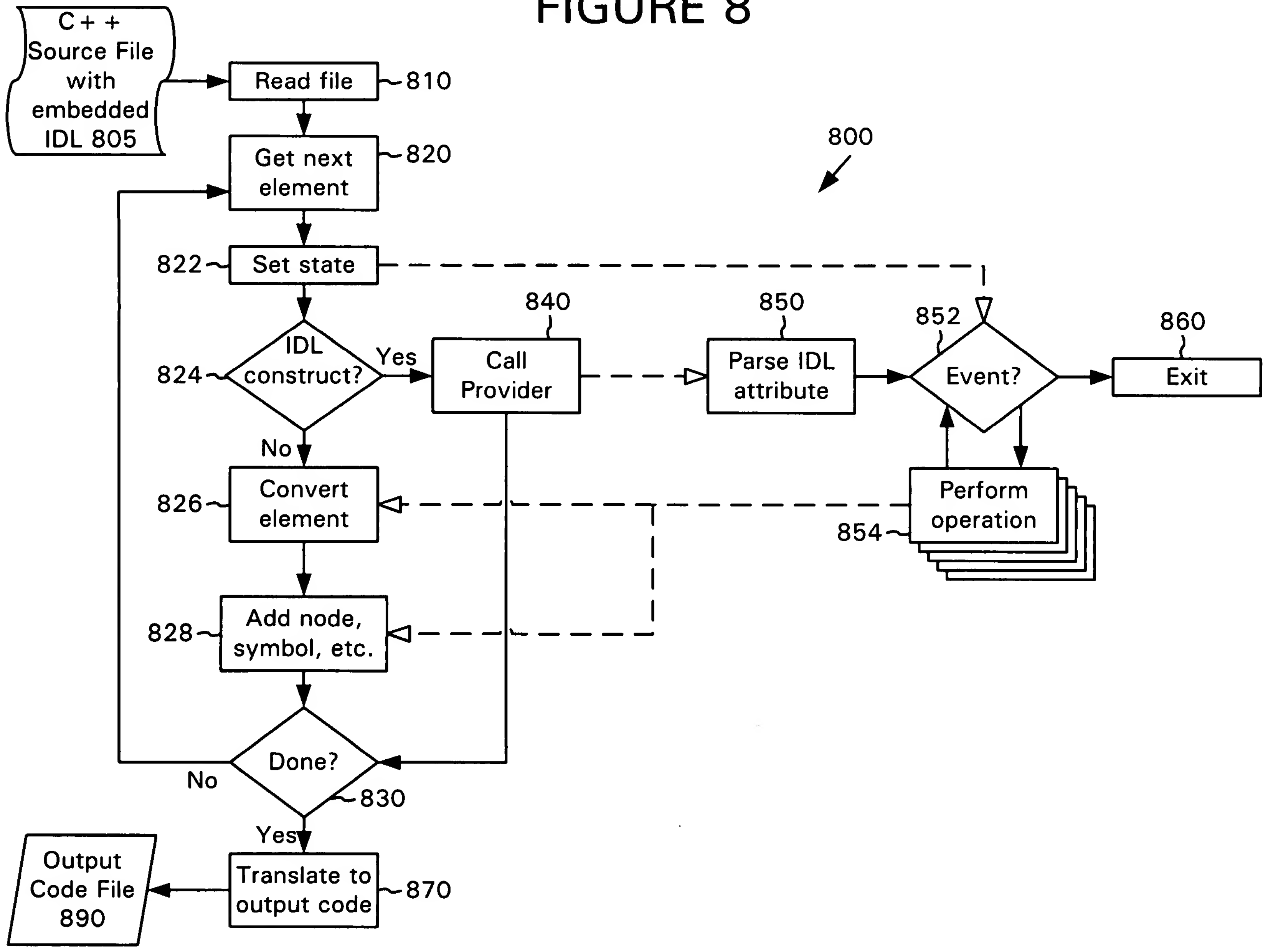
FIGURE 8



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```
[coclass, progid(CTest.17), helpstring("interface CTest"), uuid(12341234-1234-1234-1234-123412341234)]
struct CTest : ITest, ITest2 ,
   /* + + + Added Baseclass */ public CComCoClass<CTest, &__uuidof(CTest)>,
   /* + + + Added Baseclass */ public CComObjectRootEx<CComSingleThreadModel>,
   /* + + + Added Baseclass */ public IProvideClassInfoImpl<&__uuidof(CTest)>
{
   void Grade(E e, char* pc) {
      printf("CTest::Grade(e=%d)\n", e);
      *pc = 'A';
   }
   HRESULT Score(S* a, float b, VARIANT c) {
      printf("CTest::Score(a=%p,b=%f,c=%d)\n", a, b, c.iVal);
      return S_OK;
   }
   void Display() {
      printf("CTest::Display()\n");
   }
   void put_StudentID(int i) {
      printf("CTest::put_StudentID(i=%d)\n", i);
   }
   void get_StudentID(int* ) {
      printf("CTest::get_StudentID()\n");
   }
   HRESULT Hours(int a, float b) {
      printf("CTest::Hours(a=%d,b=%f)\n", a, b);
      return S_OK;
   }
```

FIGURE 9a

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```
//+ + + Start Injected Code
virtual HRESULT STDMETHODCALLTYPE Invoke(
            /* [in] */ DISPID dispIdMember,
            /* [in] */ REFIID riid,
            /* [in] */ LCID lcid,
            /* [in] */ WORD wFlags,
            /* [out][in] */ DISPPARAMS *pDispParams,
            /* [out] */ VARIANT *pVarResult,
            /* [out] */ EXCEPINFO *pExcepInfo,
            /* [out] */ UINT *puArgErr)
{
    HRESULT hr = S_OK;
    if (pDispParams = = 0) {
        return DISP_E_BADVARTYPE;
    }
    if (pVarResult != 0) {
        VariantInit(pVarResult);
    }
    switch (dispIdMember) {
    case 18:
        {
            S* i1 = (S*) V_RECORD(&pDispParams->rgvarg[2]);
            float i2 = V_R4(&pDispParams->rgvarg[1]);
            VARIANT i3 = pDispParams->rgvarg[0];
```

FIGURE 9b

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```
            hr = Score(i1, i2, i3);
            if (pVarResult != 0) {
                V_VT(pVarResult) = VT_ERROR;
                V_ERROR(pVarResult) = hr;
            }
            break;
        }
    case 34:
        {
            E i1 = (E) V_I4(&pDispParams->rgvarg[1]);
            char* i2 = (char*) V_I1REF(&pDispParams->rgvarg[0]);
            Grade(i1, i2);
            if (pVarResult != 0) {
                V_VT(pVarResult) = VT_UI1 | VT_BYREF;
                V_I1REF(pVarResult) = (char*) i2;
            }
            break;
        }
    default:
        return DISP_E_MEMBERNOTFOUND;
    }
    return hr;
}
```

FIGURE 9c

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```
virtual HRESULT STDMETHODCALLTYPE GetIDsOfNames(
            /* [in] */ REFIID riid,
            /* [size_is][in] */ LPOLESTR *rgszNames,
            /* [in] */ UINT cNames,
            /* [in] */ LCID lcid,
            /* [size_is][out] */ DISPID *rgDispId)
{
    static LPOLESTR names[] = { L"Grade", L"Score" };
    static DISPID dids[] = { 34, 18 };
    for (unsigned int i = 0; i < cNames; ++i) {
        int fFoundIt = 0;
        for (unsigned int j = 0; j < sizeof(names)/sizeof(LPOLESTR); ++j) {
            if (lstrcmpW(rgszNames[i], names[j]) == 0) {
                fFoundIt = 1;
                rgDispId[i] = dids[j];
            }
        }
        if (fFoundIt == 0) {
            return DISP_E_UNKNOWNNAME;
        }
    }
    return S_OK;
}
```

FIGURE 9d

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```
HRESULT TypeInfoHelper(REFIID iidDisp, LCID /*lcid*/, ITypeInfo** ppTypeInfo)
{
   if (ppTypeInfo == NULL) {
      return E_POINTER;
   }
   *ppTypeInfo = NULL;
   TCHAR szModule1[_MAX_PATH];
   ::GetModuleFileName(_pModule->GetModuleInstance(), szModule1, _MAX_PATH);
   USES_CONVERSION;
   CComPtr<ITypeLib> spTypeLib;
   HRESULT hr = LoadTypeLib(T2OLE(szModule1), &spTypeLib);
   if (SUCCEEDED(hr)) {
      CComPtr<ITypeInfo> spTypeInfo;
      hr = spTypeLib->GetTypeInfoOfGuid(iidDisp, &spTypeInfo);
      if (SUCCEEDED(hr)) {
         *ppTypeInfo = spTypeInfo.Detach();
      }
   }
   return hr;
}
```

FIGURE 9e

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```
    virtual HRESULT STDMETHODCALLTYPE GetTypeInfoCount(unsigned int*  pctinfo)
    {
       if (pctinfo == NULL) {
          return E_POINTER;
       }
       CComPtr<ITypeInfo> spTypeInfo;
       *pctinfo =
             (SUCCEEDED(TypeInfoHelper(__uuidof(ITest), 0, &spTypeInfo))) ? 1 : 0;
       return S_OK;
    }
    virtual HRESULT STDMETHODCALLTYPE GetTypeInfo(unsigned int iTInfo, LCID lcid, ITypeInfo** ppTInfo)
    {
       if (iTInfo != 0) {
          return DISP_E_BADINDEX;
       }
       return TypeInfoHelper(__uuidof(ITest), lcid, ppTInfo);
    }
//+++ End Injected Code
.........................................
};
```

FIGURE 9f

FIGURE 10a

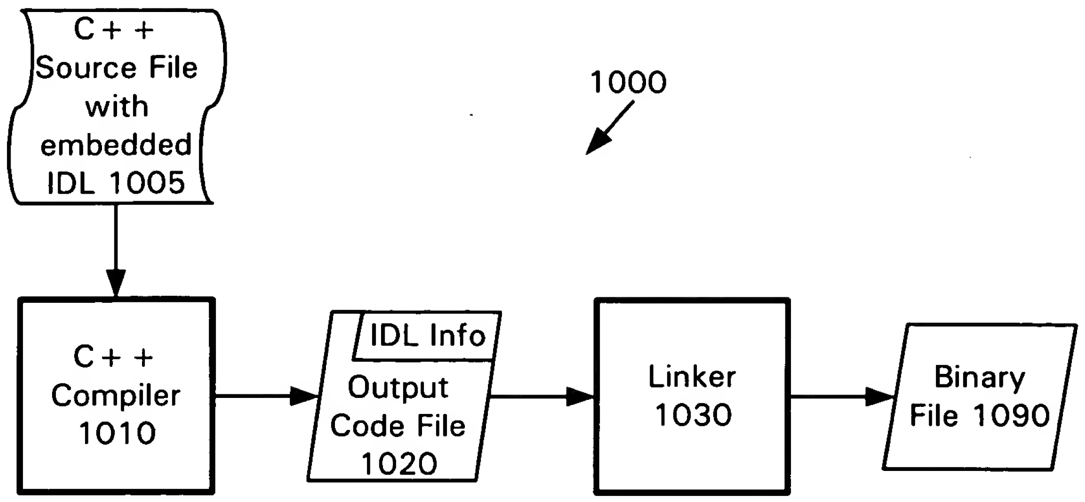
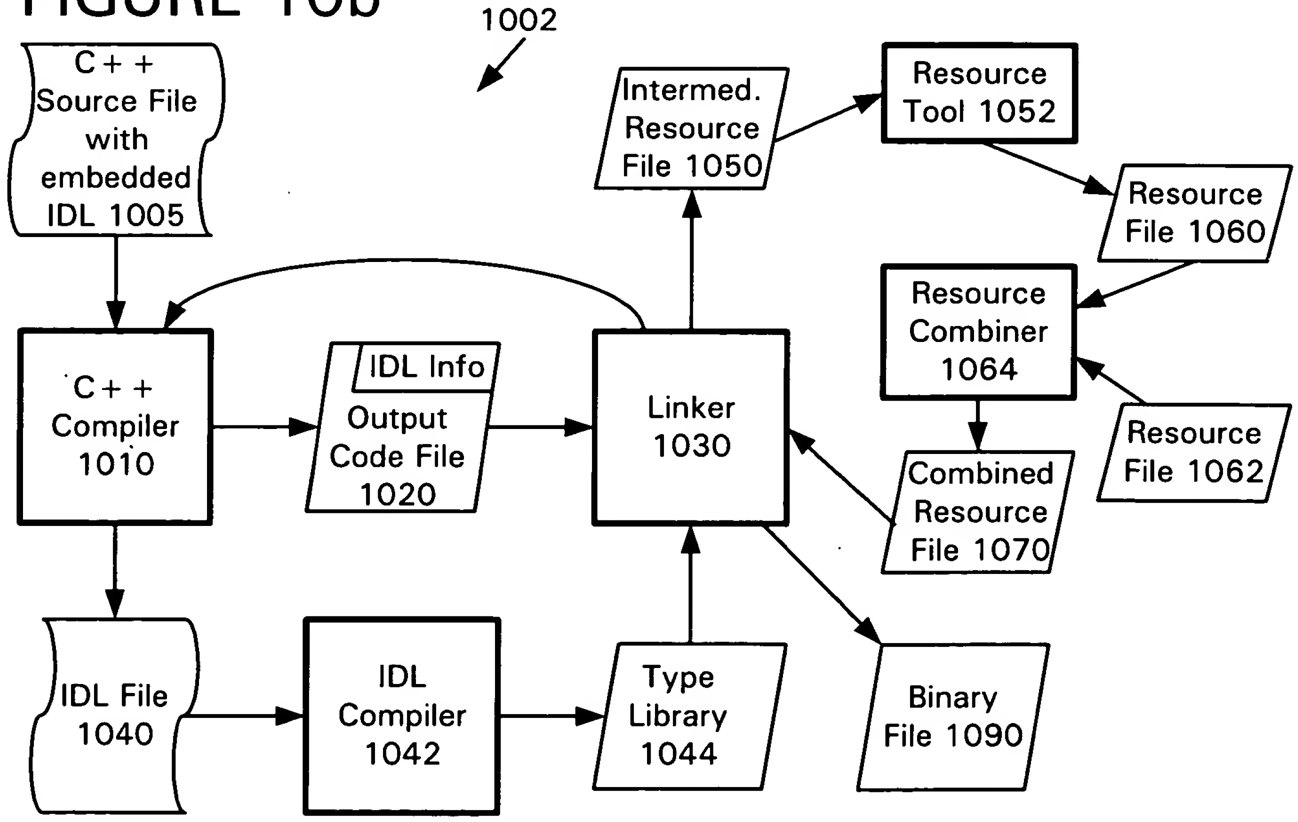


FIGURE 10b



1002
C++ Source File with embedded IDL 1005
Intermed. Resource File 1050
Resource Tool 1052
Resource File 1060
Resource Combiner 1064
Resource File 1062
C++ Compiler 1010
IDL Info
Output Code File 1020
Linker 1030
Combined Resource File 1070
IDL File 1040
IDL Compiler 1042
Type Library 1044
Binary File 1090